

Ph.D. defense

Institut de Chimie Séparative de Marcoule / CEA Marcoule
(UMR 5257, CEA, CNRS, Université Montpellier, ENSCM)

ERNESTO SCOPPOLA

will present his Ph.D. dissertation

Solvent extraction: a study of the liquid/liquid interface with ligands combining X-ray and neutron reflectivity measurements

The defense will take place on **Monday, November 30, 2015** at **1.30 pm**
in the ICSM Auditorium

In the frame of the nuclear waste reprocessing and various kinds of critical metals recycling methods, solvent extraction is one of the most used technological processes. The liquid interface between two immiscible fluids is considered as a region where many physical and chemical phenomena take place and can limit or promote the transfer of species between both fluids. The structure of these interfaces has to be known as a function of several thermodynamical parameters to be able to determine the associated energy landscape. X-ray and neutron reflectivity are suitable techniques to probe such kind of fluctuating and buried interfaces at the nanometer scale and at equilibrium. For this study, a new cell has been built and a specific data analysis procedure was established. We have focused our study on two different biphasic systems (water/dodecane) containing lanthanides salts and two different nonionic ligands or extractant molecules: DMDBTDMA and DMDOHEMA diamides. These ligands are known to have different behaviour in the lanthanides extraction process. Although the amphiphilic chemical structure of both diamides is well known, the structure of the liquid/liquid interface appears to be different as those expected for a classical surfactant molecule. This structure looks more complex, varies as a function of the ligand concentration in the organic phase (below the critical aggregation concentration) and as a function of the proton and salt concentration of the aqueous phase. A monolayer organization does not appear as the main interfacial structuration and a thicker organic layer with an excess of salt has to be considered. In the case of the DMDBTDMA, this thicker region (approximately three or four times the length of the ligand) creates an interfacial region where oil and water molecules as well as some salts can mix in. The DMDOHEMA system shows a different structuration where we can roughly observe also a thick layer of the ligand (approximately two times the length of the ligand) but located more within the oil phase and forming a barrier to the salt distribution. These different interfacial structures made of DMDBTDMA and DMDOHEMA could allow to explain the diffusive or kinetic regime of ion transfer observed respectively in similar systems by others authors.

Keywords: Reflectivity; Liquid/Liquid; Neutrons; X-ray; DMDBTDMA; DMDOHEMA

